

# **9VAC25-260-140. Criteria for surface water.**

A. Instream water quality conditions shall not be acutely<sup>1</sup> or chronically<sup>2</sup> toxic except as allowed in 9VAC25-260-20 B (mixing zones). The following are definitions of acute and chronic toxicity conditions:

"Acute toxicity" means an adverse effect that usually occurs shortly after exposure to a pollutant. Lethality to an organism is the usual measure of acute toxicity. Where death is not easily detected, immobilization is considered equivalent to death.

"Chronic toxicity" means an adverse effect that is irreversible or progressive or occurs because the rate of injury is greater than the rate of repair during prolonged exposure to a pollutant. This includes low level, long-term effects such as reduction in growth or reproduction.

B. The following table is a list of numerical water quality criteria for specific parameters.

Table of Parameters<sup>6, 7</sup>

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Acenaphthene (µg/l) 83329					670	990
Acrolein (µg/l) 107028					6.1	9.3
Acrylonitrile (µg/l) 107131 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.51	2.5
Aldrin (µg/l) 309002 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .	3.0		1.3		0.00049	0.00050
Ammonia (µg/l) 766-41-7 Chronic criterion is a 30-day average concentration not to be exceeded more than once every three (3) years on the average.(see 9VAC25-260-155)						
Anthracene (µg/l) 120127					8,300	40,000
Antimony (µg/l) 7440360					5.6	640
Arsenic (µg/l) <sup>5</sup>	340	150	69	36	10	

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
7440382						
Bacteria (see 9VAC25-260-160 and 170)						
Barium (µg/l) 7440393					2,000	
Benzene (µg/l) 71432  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					22	510
Benzidine (µg/l) 92875  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					0.00086	0.0020
Benzo (a) anthracene (µg/l) 56553  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					0.038	0.18
Benzo (b) fluoranthene (µg/l) 205992  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					0.038	0.18
Benzo (k) fluoranthene (µg/l) 207089  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					0.038	0.18
Benzo (a) pyrene (µg/l) 50328  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					0.038	0.18

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Bis2-Chloroethyl Ether 111444  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					0.30	5.3
Bis2-Chloroisopropyl Ether (µg/l) 108601					1,400	65,000
Bis2-Ethylhexyl Phthalate (µg/l) 117817  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> . Synonym = Di-2-Ethylhexyl Phthalate.					12	22
Bromoform (µg/l) 75252  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					43	1,400
Butyl benzyl phthalate (µg/l) 85687					1,500	1,900

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Cadmium (µg/l) <sup>5</sup> 7440439  Freshwater values are a function of total hardness as calcium carbonate (CaCO <sub>3</sub> ) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.  Freshwater acute criterion (µg/l) WER $e^{\{1.128[\ln(\text{hardness})] - 3.828\}}$  Freshwater chronic criterion (µg/l) WER $[e^{\{0.7852[\ln(\text{hardness})] - 3.490\}}]$  WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F  e = natural antilogarithm ln = natural logarithm	3.9 CaCO <sub>3</sub> = 100	1.1 CaCO <sub>3</sub> = 100	40 X WER	8.8 X WER	5	
Carbon tetrachloride (µg/l) 56235  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					2.3	16
Chlordane (µg/l) 57749  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .	2.4	0.0043	0.09	0.0040	0.0080	0.0081

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Chloride (µg/l) 16887006  Human Health criterion to maintain acceptable taste and aesthetic quality and applies at the drinking water intake.  Chloride criteria do not apply in Class II transition zones (see subsection C of this section).	860,000	230,000			250,000	
Chlorine, Total Residual (µg/l) 7782505  In DGIF class i and ii trout waters (9VAC25-260-390 through 9VAC25-260-540) or waters with threatened or endangered species are subject to the halogen ban (9VAC25-260-110).	19 See 9VAC25 -260- 110	11 See 9VAC25 -260- 110				
Chlorine Produced Oxidant (µg/l) 7782505			13	7.5		
Chlorobenzene (µg/l) 108907					130	1,600
Chlorodibromomethane (µg/l) 124481  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					4.0	130
Chloroform (µg/l) 67663					340	11,000
2-Chloronaphthalene (µg/l) 91587					1,000	1,600
2-Chlorophenol (µg/l) 95578					81	150
Chlorpyrifos (µg/l) 2921882	0.083	0.041	0.011	0.0056		

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Chromium III (µg/l) <sup>5</sup> 16065831  Freshwater values are a function of total hardness as calcium carbonate CaCO <sub>3</sub> mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.  Freshwater acute criterion µg/l $WER [e^{\{0.8190[\ln(\text{hardness})]+3.7256\}}]$ (CF <sub>a</sub> )  Freshwater chronic criterion µg/l $WER [e^{\{0.8190[\ln(\text{hardness})]+0.6848\}}]$ (CF <sub>c</sub> )  WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140.F  e = natural antilogarithm ln=natural logarithm CF = conversion factor a (acute) or c (chronic) CF <sub>a</sub> = 0.316 CF <sub>c</sub> =0.860	570 (CaCO <sub>3</sub> = 100)	74 (CaCO <sub>3</sub> = 100)			100 (total Cr)	
Chromium VI (µg/l) <sup>5</sup> 18540299	16	11	1,100	50		
Chrysene (µg/l) 218019  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.0038	0.018

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
<p>Copper (µg/l)<sup>5</sup> 7440508</p> <p>Freshwater values are a function of total hardness as calcium carbonate CaCO<sub>3</sub> mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.</p> <p>Freshwater acute criterion (µg/l) WER [e<sup>{0.9422[ln(hardness)]-1.700}</sup>] (CF<sub>a</sub>)</p> <p>Freshwater chronic criterion (µg/l) WER [e<sup>{0.8545[ln(hardness)]-1.702}</sup>] (CF<sub>c</sub>)</p> <p>WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F.</p> <p>e = natural antilogarithm ln=natural logarithm CF = conversion factor a (acute) or c (chronic) CF<sub>a</sub> = 0.960 CF<sub>c</sub> = 0.960</p> <p>Acute saltwater criterion is a 24-hour average not to be exceeded more than once every three years on the average.</p>	13 CaCO <sub>3</sub> = 100	9.0 CaCO <sub>3</sub> = 100	9.3 X WER	6.0 X WER	1,300	
Cyanide, Free (µg/l) 57125	22	5.2	1.0	1.0	140	16,000

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
DDD (µg/l) 72548  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.0031	0.0031
DDE (µg/l) 72559  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.0022	0.0022
DDT (µg/l) 50293  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .  Total concentration of DDT and metabolites shall not exceed aquatic life criteria.	1.1	0.0010	0.13	0.0010	0.0022	0.0022
Demeton (µg/l) 8065483		0.1		0.1		
Diazinon (µg/l) 333415	0.17	0.17	0.82	0.82		
Dibenz (a, h) anthracene (µg/l) 53703  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.038	0.18
1,2-Dichlorobenzene (µg/l) 95501					420	1,300
1,3- Dichlorobenzene (µg/l) 541731					320	960
1,4 Dichlorobenzene (µg/l) 106467					63	190
3,3 Dichlorobenzidine 91941  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.21	0.28



PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Dichlorobromomethane (µg/l) 75274  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					5.5	170
1,2 Dichloroethane (µg/l) 107062  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					3.8	370
1,1 Dichloroethylene (µg/l) 75354					330	7,100
1,2-trans-dichloroethylene (µg/l) 156605					140	10,000
2,4 Dichlorophenol (µg/l) 120832					77	290
2,4 Dichlorophenoxy acetic acid (2,4-D) (µg/l) 94757					100	
1,2-Dichloropropane (µg/l) 78875  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					5.0	150
1,3-Dichloropropene (µg/l) 542756  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					3.4	210
Dieldrin (µg/l) 60571  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .	0.24	0.056	0.71	0.0019	0.00052	0.00054
Diethyl Phthalate (µg/l) 84662					17,000	44,000

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
2,4 Dimethylphenol (µg/l) 105679					380	850
Dimethyl Phthalate (µg/l) 131113					270,000	1,100,000
Di-n-Butyl Phthalate (µg/l) 84742					2,000	4,500
2,4 Dinitrophenol (µg/l) 51285					69	5,300
2-Methyl-4,6-Dinitrophenol (µg/l) 534521					13	280
2,4 Dinitrotoluene (µg/l) 121142  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					1.1	34
Dioxin 2, 3, 7, 8- tetrachlorodibenzo-p-dioxin (µg/l) 1746016					5.0 E-8	5.1 E-8
1,2-Diphenylhydrazine (µg/l) 122667  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>					0.36	2.0
Dissolved Oxygen (µg/l) (See 9VAC25-260-50)						
Alpha-Endosulfan (µg/l) 959988  Total concentration alpha and beta-endosulfan shall not exceed aquatic life criteria.	0.22	0.056	0.034	0.0087	62	89
Beta-Endosulfan (µg/l) 33213659  Total concentration alpha and beta-endosulfan shall not exceed aquatic life criteria.	0.22	0.056	0.034	0.0087	62	89

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Endosulfan Sulfate (µg/l) 1031078					62	89
Endrin (µg/l) 72208	0.086	0.036	0.037	0.0023	0.059	0.060
Endrin Aldehyde (µg/l) 7421934					0.29	0.30
Ethylbenzene (µg/l) 100414					530	2,100
Fecal Coliform (see 9VAC25-260-160)						
Fluoranthene (µg/l) 206440					130	140
Fluorene (µg/l) 86737					1,100	5,300
Foaming Agents (µg/l) Criterion measured as methylene blue active substances. Criterion to maintain acceptable taste, odor, or aesthetic quality of drinking water and applies at the drinking water intake.					500	
Guthion (µg/l) 86500		0.01		0.01		
Heptachlor (µg/l) 76448  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .	0.52	0.0038	0.053	0.0036	0.00079	0.00079
Heptachlor Epoxide (µg/l) 1024573  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .	0.52	0.0038	0.053	0.0036	0.00039	0.00039
Hexachlorobenzene (µg/l) 118741  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.0028	0.0029

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Hexachlorobutadiene (µg/l) 87683 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					4.4	180
Hexachlorocyclohexane Alpha-BHC (µg/l) 319846 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.026	0.049
Hexachlorocyclohexane Beta-BHC (µg/l) 319857 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.091	0.17
Hexachlorocyclohexane (µg/l) (Lindane) Gamma-BHC 58899 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .	0.95		0.16		0.98	1.8
Hexachlorocyclopentadiene (µg/l) 77474					40	1,100
Hexachloroethane (µg/l) 67721 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					14	33
Hydrogen sulfide (µg/l) 7783064		2.0		2.0		
Indeno (1,2,3,-cd) pyrene (µg/l) 193395 Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.038	0.18

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Iron (µg/l) 7439896  Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					300	
Isophorone (µg/l) 78591  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					350	9,600
Kepone (µg/l) 143500		zero		zero		
Lead (µg/l) <sup>5</sup> 7439921  Freshwater values are a function of total hardness as calcium carbonate CaCO <sub>3</sub> mg/l and the water effect ratio. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.  Freshwater acute criterion (µg/l) WER [e <sup>{1.273[ln(hardness)]-1.084}</sup> ]  Freshwater chronic criterion (µg/l) WER [e <sup>{1.273[ln(hardness)]-3.259}</sup> ]  WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F  e = natural antilogarithm ln = natural logarithm	120 CaCO <sub>3</sub> = 100	14 CaCO <sub>3</sub> = 100	240 X WER	9.3 X WER	15	

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Malathion (µg/l) 121755		0.1		0.1		
Manganese (µg/l) 7439965  Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					50	
Mercury (µg/l) <sup>5</sup> 7439976	1.4	0.77	1.8	0.94		
Methyl Bromide (µg/l) 74839					47	1,500
Methyl Mercury (Fish Tissue Criterion mg/kg) <sup>8</sup> 22967926					0.30	0.30
Methylene Chloride (µg/l) 75092  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> Synonym = Dichloromethane					46	5,900
Methoxychlor (µg/l) 72435		0.03		0.03	100	
Mirex (µg/l) 2385855		zero		zero		

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
<p>Nickel (µg/l)<sup>5</sup> 744002</p> <p>Freshwater values are a function of total hardness as calcium carbonate CaCO<sub>3</sub> mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.</p> <p>Freshwater acute criterion (µg/l) WER [e<sup>{0.8460[ln(hardness)] + 1.312}</sup>] (CF<sub>a</sub>)</p> <p>Freshwater chronic criterion (µg/l) WER [e<sup>{0.8460[ln(hardness)] - 0.8840}</sup>] (CF<sub>c</sub>)</p> <p>WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F</p> <p>e = natural antilogarithm ln = natural logarithm CF = conversion factor a (acute) or c (chronic) CF<sub>a</sub> = 0.998 CF<sub>c</sub> = 0.997</p>	180 CaCO <sub>3</sub> = 100	20 CaCO <sub>3</sub> = 100	74 X WER	8.2 X WER	610	4,600
Nitrate as N (µg/l) 14797558					10,000	
Nitrobenzene (µg/l) 98953					17	690
<p>N-Nitrosodimethylamine (µg/l) 62759</p> <p>Known or suspected carcinogen; human health criteria at risk level 10<sup>-5</sup>.</p>					0.0069	30

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
N-Nitrosodiphenylamine (µg/l) 86306  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					33	160 60
N-Nitrosodi-n-propylamine (µg/l) 621647  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.050	5.1
Nonylphenol 1044051	28	6.6	7.0	1.7		
Parathion (µg/l) 56382	0.065	0.013				
PCB Total (µg/l) 1336363  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup>		0.014		0.030	0.00064	0.00064
Pentachlorophenol (µg/l) 87865  Known or suspected carcinogen; human health criteria risk level at 10 <sup>-5</sup>  Freshwater acute criterion (µg/l) e <sup>(1.005(pH)-4.869)</sup>  Freshwater chronic criterion (µg/l) e <sup>(1.005(pH)-5.134)</sup>	8.7 pH = 7.0	6.7 pH = 7.0	13	7.9	2.7	30
pH See 9VAC25-260-50						
Phenol (µg/l) 108952					10,000	860,000
Phosphorus Elemental (µg/l) 7723140				0.10		



PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Pyrene (µg/l) 129000					830	4,000
Radionuclides						
Gross Alpha Particle Activity (pCi/L)					15	
Beta Particle & Photon Activity (mrem/yr) (formerly man-made radionuclides)					4	
Combined Radium 226 and 228 (pCi/L)					5	
Uranium (µg/L)					30	
Selenium (µg/l) <sup>5</sup> 7782492						
WER shall not be used for freshwater acute and chronic criteria. Freshwater criteria expressed as total recoverable.	20	5.0	290 X WER	71 X WER	170	4,200

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
<p>Silver (µg/l)<sup>5</sup> 7440224</p> <p>Freshwater values are a function of total hardness as calcium carbonate (CaCO<sub>3</sub>) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.</p> <p>Freshwater acute criterion (µg/l) WER [e<sup>{1.72[ln(hardness)]-6.52}</sup>] (CF<sub>a</sub>)</p> <p>WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F</p> <p>e = natural antilogarithm</p> <p>ln=natural logarithm</p> <p>CF = conversion factor a (acute) or c (chronic)</p> <p>CF<sub>a</sub> = 0.85</p>	3.4; CaCO <sub>3</sub> = 100		1.9 X WER			
<p>Sulfate (µg/l)</p> <p>Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.</p>					250,000	
<p>Temperature</p> <p>See 9VAC25-260-50</p>						
<p>1,1,2,2-Tetrachloroethane (µg/l) 79345</p> <p>Known or suspected carcinogen; human health criteria at risk level 10<sup>-5</sup>)</p>					1.7	40

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
Tetrachloroethylene (µg/l) 127184  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> )					6.9	33
Thallium (µg/l) 7440280					0.24	0.47
Toluene (µg/l) 108883					510	6,000
Total Dissolved Solids (µg/l) Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					500,000	
Toxaphene (µg/l) 8001352  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .	0.73	0.0002	0.21	0.0002	0.0028	0.0028
Tributyltin (µg/l) 60105	0.46	0.072	0.42	0.0074		
1, 2, 4 Trichlorobenzene (µg/l) 120821					35	70
1,1,2-Trichloroethane (µg/l) 79005  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					5.9	160
Trichloroethylene (µg/l) 79016  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					25	300
2, 4, 6 –Trichlorophenol 88062  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					14	24

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply <sup>3</sup>	All Other Surface Waters <sup>4</sup>
	Acute <sup>1</sup>	Chronic <sup>2</sup>	Acute <sup>1</sup>	Chronic <sup>2</sup>		
2-(2, 4, 5 – Trichlorophenoxy propionic acid (Silvex) (µg/l) 93721					50	
Vinyl Chloride (µg/l) 75014  Known or suspected carcinogen; human health criteria at risk level 10 <sup>-5</sup> .					0.25	24
Zinc (µg/l) <sup>5</sup> 744066  Freshwater values are a function of total hardness as calcium carbonate (CaCO <sub>3</sub> ) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum, hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.  Freshwater acute criterion µg/l WER [e <sup>{0.8473[ln(hardness)]+0.884}</sup> ] (CF <sub>a</sub> )  Freshwater chronic criterion µg/l WER [e <sup>{0.8473[ln(hardness)]+0.884}</sup> ] (CF <sub>c</sub> )  WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25- 260-140 F  e = base e exponential function.  ln = log normal function  CF <sub>a</sub> = 0.978  CF <sub>c</sub> = 0.986	120 CaCO <sub>3</sub> = 100	120 CaCO <sub>3</sub> = 100	90 X WER	81 X WER	7,400	26,000

<sup>1</sup>One hour average concentration not to be exceeded more than once every 3 years on the average, unless otherwise noted.

<sup>2</sup>Four-day average concentration not to be exceeded more than once every 3 years on the average, unless otherwise noted.

<sup>3</sup>Criteria have been calculated to protect human health from toxic effects through drinking water and fish consumption, unless otherwise noted and apply in segments designated as PWS in 9VAC25-260-390-540.

<sup>4</sup>Criteria have been calculated to protect human health from toxic effects through fish consumption, unless otherwise noted and apply in all other surface waters not designated as PWS in 9VAC25-260-390-540.

<sup>5</sup>Acute and chronic saltwater and freshwater aquatic life criteria apply to the biologically available form of the metal and apply as a function of the pollutant's water effect ratio (WER) as defined in 9VAC25-260-140 F (WER X criterion). Metals measured as dissolved shall be considered to be biologically available, or, because local receiving water characteristics may otherwise affect the biological availability of the metal, the biologically available equivalent measurement of the metal can be further defined by determining a Water Effect Ratio (WER) and multiplying the numerical value shown in 9VAC25-260-140 B by the WER. Refer to 9VAC25-260-140 F. Values displayed above in the table are examples and correspond to a WER of 1.0. Metals criteria have been adjusted to convert the total recoverable fraction to dissolved fraction using a conversion factor. Criteria that change with hardness have the conversion factor listed in the table above.

<sup>6</sup>The flows listed below are default design flows for calculating steady state waste load allocations unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.

**Aquatic Life:**

Acute criteria	1Q10
Chronic criteria	7Q10
Chronic criteria (ammonia)	30Q10

**Human Health:**

Noncarcinogens	30Q5
Carcinogens	Harmonic mean

The following are defined for this section:

"1Q10" means the lowest flow averaged over a period of one day which on a statistical basis can be expected to occur once every 10 climatic years.

"7Q10" means the lowest flow averaged over a period of seven consecutive days that can be statistically expected to occur once every 10 climatic years.

"30Q5" means the lowest flow averaged over a period of 30 consecutive days that can be statistically expected to occur once every five climatic years.

"30Q10" means the lowest flow averaged over a period of 30 consecutive days that can be statistically expected to occur once every 10 climatic years.

"Averaged" means an arithmetic mean.

"Climatic year" means a year beginning on April 1 and ending on March 31.

<sup>7</sup>The criteria listed in this table are two significant digits. For other criteria that are referenced to other sections of this regulation in this table, all numbers listed as criteria values are significant.

<sup>8</sup>The fish tissue criterion for methylmercury applies to a concentration of 0.30 mg/kg as wet weight in edible tissue for species of fish and/or shellfish resident in a waterbody that are commonly eaten in the area and have commercial, recreational, or subsistence value.

C. Application of freshwater and saltwater numerical criteria. The numerical water quality criteria listed in subsection B of this section (excluding dissolved oxygen, pH, temperature) shall be applied according to the following classes of waters (see 9VAC25-260-50) and boundary designations:

CLASS OF WATERS	NUMERICAL CRITERIA
I and II (Estuarine Waters)	Saltwater criteria apply
II (Transition Zone)	More stringent of either the freshwater or saltwater criteria apply
II (Tidal Freshwater), III, IV, V, VI and VII	Freshwater criteria apply

The following describes the boundary designations for Class II, (estuarine, transition zone and tidal freshwater waters) by river basin:

1. Rappahannock Basin. Tidal freshwater is from the fall line of the Rappahannock River to the upstream boundary of the transition zone including all tidal tributaries that enter the tidal freshwater Rappahannock River.

Transition zone upstream boundary – 38° 4' 56.59"/-76° 58' 47.93" (430 feet east of Hutchinson Swamp) to 38° 5' 23.33"/-76° 58' 24.39" (0.7 miles upstream of Peedee Creek).

Transition zone downstream boundary - 37° 58' 45.80"/-76° 55' 28.75" (1,000 feet downstream of Jenkins Landing) to 37° 59' 20.07/ -76° 53' 45.09" (0.33 miles upstream of Mulberry Point). All tidal waters that enter the transition zone are themselves transition zone waters.

Estuarine waters are from the downstream boundary of the transition zone to the mouth of the Rappahannock River (Buoy 6), including all tidal tributaries that enter the estuarine waters of the Rappahannock River.

2. York Basin. Tidal freshwater is from the fall line of the Mattaponi River at N37° 47' 20.03"/W77° 6' 15.16" (800 feet upstream of the Route 360 bridge in Aylett) to the upstream boundary of the Mattaponi River transition zone, and from the fall line of the Pamunkey River at N37° 41' 22.64" /W77° 12' 50.83" (2,000 feet upstream of Totopotomoy Creek) to the upstream boundary of the Pamunkey River transition zone, including all tidal tributaries that enter the tidal freshwaters of the Mattaponi and Pamunkey Rivers.

Mattaponi River transition zone upstream boundary – N37° 39' 29.65"/W76° 52' 53.29" (1,000 feet upstream of Mitchell Hill Creek) to N37° 39' 24.20"/W76° 52' 55.87" (across from Courthouse Landing). Mattaponi River transition zone downstream boundary – N37° 32' 19.76"/W76° 47' 29.41" (old Lord Delaware Bridge, west side) to N37° 32' 13.25"/W76° 47' 10.30" (old Lord Delaware Bridge, east side).

Pamunkey River transition zone upstream boundary – N37° 32' 36.63"/W76° 58' 29.88" (Cohoke Marsh, 0.9 miles upstream of Turkey Creek) to N37° 32' 36.51"/W76° 58' 36.48" (0.75 miles upstream of creek at Cook Landing). Pamunkey River transition zone downstream boundary – N37° 31' 57.90"/ 76° 48' 38.22" (old Eltham Bridge, west side) to N37° 32' 6.25"/W76 48' 18.82" (old Eltham Bridge, east side).

All tidal tributaries that enter the transition zones of the Mattaponi and Pamunkey Rivers are themselves in the transition zone.

Estuarine waters are from the downstream boundary of the transition zones of the Mattaponi and Pamunkey Rivers to the mouth of the York River (Tue Marsh Light) including all tidal tributaries that enter the estuarine waters of the York River.

3. James Basin. Tidal Freshwater is from the fall line of the James River in the City of Richmond upstream of Mayo Bridge to the upstream boundary of the transition zone, including all tidal tributaries that enter the tidal freshwater James River.

James River transition zone upstream boundary – N37° 14' 28.25"/W76° 56' 44.47" (at

Tettington) to N37° 13' 38.56"/W76° 56' 47.13" 0.3 miles downstream of Sloop Point.

Chickahominy River transition zone upstream boundary – N37° 25' 44.79"/W77° 1' 41.76" (Holly Landing).

Transition zone downstream boundary – N37° 12' 7.23"/W76° 37' 34.70" (near Carters Grove Home, 1.25 downstream of Grove Creek) to N37° 9' 17.23"/W76° 40' 13.45" (0.7 miles upstream of Hunnicutt Creek). All tidal waters that enter the transition zone are themselves transition zone waters.

Estuarine waters are from the downstream transition zone boundary to the mouth of the James River (Buoy 25) including all tidal tributaries that enter the estuarine waters of the James River.

4. Potomac Basin. Tidal Freshwater includes all tidal tributaries that enter the Potomac River from its fall line at the Chain Bridge (N38° 55' 46.28"/W77° 6' 59.23") to the upstream transition zone boundary near Quantico, Virginia.

Transition zone includes all tidal tributaries that enter the Potomac River from N38° 31' 27.05"/W77° 17' 7.06" (midway between Shipping Point and Quantico Pier) to N38° 23' 22.78"/W77° 1' 45.50" (one mile southeast of Mathias Point).

Estuarine waters includes all tidal tributaries that enter the Potomac River from the downstream transition zone boundary to the mouth of the Potomac River (Buoy 44B).

5. Chesapeake Bay, Atlantic Ocean, and small coastal basins. Estuarine waters include the Atlantic Ocean tidal tributaries, and the Chesapeake Bay and its small coastal basins from the Virginia state line to the mouth of the bay (a line from Cape Henry drawn through Buoys 3 and 8 to Fishermans Island), and its tidal tributaries, excluding the Potomac tributaries and those tributaries listed above.

6. Chowan River Basin. Tidal freshwater includes the Northwest River and its tidal tributaries from the Virginia-North Carolina state line to the free flowing portion, the Blackwater River and its tidal tributaries from the Virginia-North Carolina state line to the end of tidal waters at approximately state route 611 at river mile 20.90, the Nottoway River and its tidal tributaries from the Virginia-North Carolina state line to the end of tidal waters at approximately Route 674, and the North Landing River and its tidal tributaries from the Virginia-North Carolina state line to the Great Bridge Lock.

Transition zone includes Back Bay and its tributaries in the City of Virginia Beach to the Virginia-North Carolina state line.

#### D. Site-specific modifications to numerical water quality criteria.

1. The board may consider site-specific modifications to numerical water quality criteria in subsection B of this section where the applicant or permittee demonstrates that the alternate numerical water quality criteria are sufficient to protect all designated uses (see 9VAC25-260-10) of that particular surface water segment or body.

2. Any demonstration for site-specific human health criteria shall be restricted to a reevaluation of the bioconcentration or bioaccumulation properties of the pollutant. The exceptions to this restriction are for site-specific criteria for taste, odor, and aesthetic compounds noted by double asterisks in subsection B of this section and nitrates.

3. Procedures for promulgation and review of site-specific modifications to numerical water quality criteria resulting from subdivisions 1 and 2 of this subsection.

a. Proposals describing the details of the site-specific study shall be submitted to the board's staff for approval prior to commencing the study.

b. Any site-specific modification shall be promulgated as a regulation in accordance with the Administrative Process Act. All site-specific modifications shall be listed in 9VAC25-260-310 (Special standards and requirements).

#### E. Variances to water quality standards.

1. A variance from numeric criteria may be granted to a discharger if it can be demonstrated

that one or more of the conditions in 9VAC25-260-10 H limit the attainment of one or more specific designated uses.

- a. Variances shall apply only to the discharger to whom they are granted and shall be reevaluated and either continued, modified or revoked at the time of permit issuance. At that time the permittee shall make a showing that the conditions for granting the variance still apply.
- b. Variances shall be described in the public notice published for the permit. The decision to approve a variance shall be subject to the public participation requirements of the Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulation, 9VAC25-31 (Permit Regulation).
- c. Variances shall not prevent the maintenance and protection of existing uses or exempt the discharger or regulated activity from compliance with other appropriate technology or water quality-based limits or best management practices.
- d. Variances granted under this section shall not apply to new discharges.
- e. Variances shall be submitted by the department's Division of Scientific Research or its successors to the Environmental Protection Agency for review and approval/disapproval.
- f. A list of variances granted shall be maintained by the department's Division of Scientific Research or its successors.

2. None of the variances in this subsection shall apply to the halogen ban section (9VAC25-260-110) or temperature criteria in 9VAC25-260-50 if superseded by § 316(a) of the Clean Water Act requirements. No variances in this subsection shall apply to the criteria that are designed to protect human health from carcinogenic and noncarcinogenic toxic effects (subsection B of this section) with the exception of the metals, and the taste, odor, and aesthetic compounds noted by double asterisks and nitrates, listed in subsection B of this section.

#### F. Water effect ratio.

1. A water effects ratio (WER) shall be determined by measuring the effect of receiving water (as it is or will be affected by any discharges) on the bioavailability or toxicity of a metal by using standard test organisms and a metal to conduct toxicity tests simultaneously in receiving water and laboratory water. The ratio of toxicities of the metal(s) in the two waters is the WER (toxicity in receiving water divided by toxicity in laboratory water = WER). Once an acceptable WER for a metal is established, the numerical value for the metal in subsection B of this section is multiplied by the WER to produce an instream concentration that will protect designated uses. This instream concentration shall be utilized in permitting decisions.
2. The WER shall be assigned a value of 1.0 unless the applicant or permittee demonstrates to the department's satisfaction in a permit proceeding that another value is appropriate, or unless available data allow the department to compute a WER for the receiving waters. The applicant or permittee is responsible for proposing and conducting the study to develop a WER. The study may require multiple testing over several seasons. The applicant or permittee shall obtain the department's Division of Scientific Research or its successor approval of the study protocol and the final WER.
3. The Permit Regulation at 9VAC25-31-230 C requires that permit limits for metals be expressed as total recoverable measurements. To that end, the study used to establish the WER may be based on total recoverable measurements of the metals.
4. The Environmental Protection Agency views the WER in any particular case as a site-specific criterion. Therefore, the department's Division of Scientific Research or its successor shall submit the results of the study to the Environmental Protection Agency for review and approval/disapproval within 30 days of the receipt of certification from the state's Office of the Attorney General. Nonetheless, the WER is established in a permit proceeding, shall be described in the public notice associated with the permit proceeding, and applies only to the applicant or permittee in that proceeding. The department's action to approve or disapprove a WER is a case decision, not an amendment to the present regulation.



The decision to approve or disapprove a WER shall be subject to the public participation requirements of the Permit Regulation, 9VAC25-31-260 et seq. A list of final WERs will be maintained by the department's Division of Scientific Research or its successor.

5. A WER shall not be used for the freshwater and saltwater chronic mercury criteria or the freshwater acute and chronic selenium criteria.